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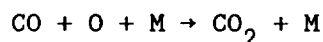
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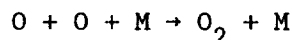
VERTICAL O_3 DISTRIBUTION AS A DIAGNOSTIC FOR EDDY DIFFUSION
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This paper illustrates the dependence of the vertical distribution of O_3 on the height variation of eddy diffusion coefficient. O_3 abundance is a valuable diagnostic for other climatological parameters. In addition, the sensitivity of O_3 distribution to eddy diffusion may aid in determining the role of surface oxidation and recombination processes and lead to a better understanding of the volatiles released or adsorbed cyclically in the Martian regolith.

In spite of rapid photolysis of the predominantly CO_2 Martian atmosphere by solar UV, observations of CO and O_2 near the surface indicate these constituents have mixing ratios less than 0.1% (1). The rate of production of CO and O is exactly the rate of CO_2 photolysis, and because the 3-body recombination reaction:

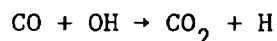


is negligibly slow, most O atoms are instead converted to O_2 by:



If no other recombination process were operating, the observed 0.1% would be produced in less than five years. Much effort has been spent attempting to explain the stability of the minor constituents against rapid increase by UV photolysis of CO_2 .

Common to all current Mars aeronomy models explaining this phenomenon is that CO_2 is reformed from CO by odd hydrogen photochemistry via the reaction:

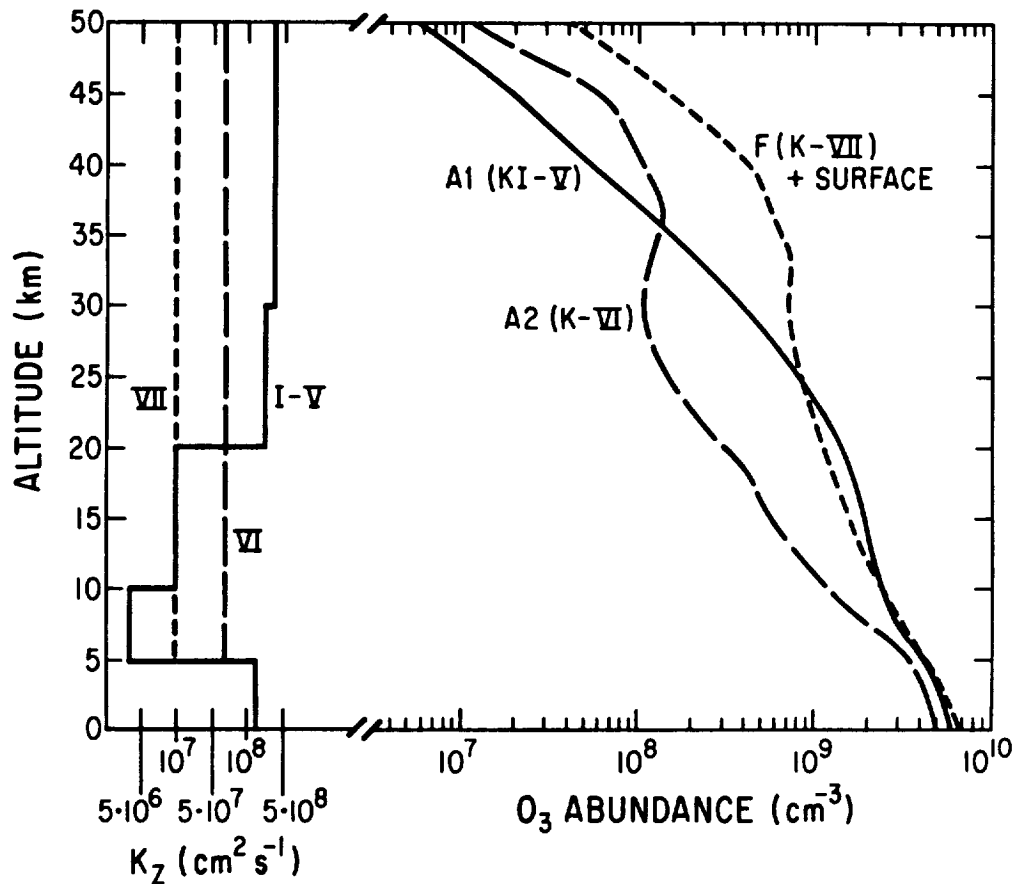


Extensive modelling has shown that various combinations of rapid downward transport of photolysis products to the region of recombination below 20 km and odd hydrogen catalysis recycling CO and O_2 to CO_2 in the presence of enhanced H_2O_2 can fit the limited observational constraints (2-5).

None of the constituents of major aeronomical interest (O_2 , CO, H_2O , H_2O_2 , O_3) have been measured in-situ in the lower atmosphere. It has been necessary to make assumptions about the vertical profiles of these

necessary to make assumptions about the vertical profiles of these constituents and the eddy diffusion coefficient. The figure illustrates these points with three computed profiles (7) of eddy coefficients and the corresponding ozone distribution. Additional calculations are in progress.

Vertical O₃ Distribution as a Function
of Height Variation in Eddy Diffusion Coefficients (K_z)



O₃ profiles computed by Kong and McElroy (6) are plotted on the right side of the figure and correspond to the respective eddy diffusion profiles at the left.

VERTICAL O₃ DISTRIBUTION

Tyler, A. L.

Simultaneous measurements of pressure, temperature and vertical profiles of H₂O vapor, O₃, CO, and O₂ are needed before atmospheric processes can be well understood. In particular, a stellar occultation experiment which provides a high resolution vertical profile of H₂O in absorption and a dayglow limb emission detector to measure the 1.27 μm emission of O₂(¹Δ_g), the photolysis product of O₃, can provide direct evidence for the magnitude of the vertical profile of the eddy diffusion coefficient. The payload chosen for Mars Observer will not make all these measurements but a future opportunity (Mars Aeronomy Observer) is likely.

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